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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,379	02/27/2004	Ling-Zhong Zeng	079361-9010-00	4944
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MICHAEL BEST & FRIEDRICH, LLP 100 E WISCONSIN AVENUE MILWAUKEE, WI 53202			EXAMINER EDGAR, RICHARD A	
			ART UNIT	PAPER NUMBER
			3745	

DATE MAILED: 09/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/789,379

Applicant(s)

ZENG ET AL. *e*

Examiner

Richard Edgar

Art Unit

3745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 Feb. 2004 under 37 C.F.R. §1.53(b).  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-122 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☒ Claim(s) 14-70 and 85-122 is/are allowed.  
6) ☒ Claim(s) 1-5, 71-74, 79 and 80 is/are rejected.  
7) ☒ Claim(s) 6-13, 75-78 and 81-84 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 27 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Drawings*

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: motor drive shaft 25 (page 5, line 29; page 6, line 13; page 13, line 7); fan assembly 110 (page 13, line 17, line 24).

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 20 (Fig. 1); 52, 152 (Fig. 13).

Art Unit: 3745

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

The examiner notes the use of the English units of inches throughout the specification and claims. Applicants are encouraged to use metric (S.I.) units in patent applications (see MPEP 6083.01 IV).

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

The disclosure is objected to because of the following informalities:

On page 14, line 5, "25" should be -- 125 --.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent No. 4,378,196 (Leskinen hereinafter).

Leskinen show a centrifugal fan, comprising: a housing comprising an inlet wall and a back wall 4 spaced axially away from and opposite the inlet wall, the inlet wall having an aperture 5 to allow gases to enter the housing; and an impeller 2 contained at least partially within the housing and rotatable about an axis with respect to the housing, the impeller comprising a plate 3 extending radially away from the axis; and a plurality of fan blades 1 coupled to the plate and extending toward the back wall 4, each blade having a peripheral edge at least partially defining a heel portion located a radial distance from the axis, a tip portion located a greater radial distance from the axis, and a point positioned a maximum axial distance from the plate, the point axially separated from the back wall of the housing by a first distance (a). The distance is about 4 mm  $\pm$  2 mm (col. 1, lines 61-64).

The back wall 4 and blade 1 axial ends are both flat (see Fig. 3).

The fan further comprises a second plurality of fan blades on the impeller 2, coupled to the plate 4 and extending toward the inlet wall.

Claims 71-74 are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent No. 4,526,506 (Köger et al. hereinafter).

Köger et al. disclose a centrifugal fan, comprising: a housing 1 comprising an inlet wall 17 and a back wall 18 spaced axially away from and opposite the inlet wall, the inlet wall having an aperture 6 to allow gases to enter the housing; and an impeller contained at least partially within the housing and rotatable about an axis with respect to the housing, the impeller comprising a plate 14 extending radially away from the axis; and a plurality of fan blades 13 on the plate, each fan blade comprising a chord; a heel end; a tip end opposite the heel end, located a greater radial distance from the axis than the heel end, and tracing an imaginary circle about the axis upon rotation of the impeller; an intake angle  $\beta_1^D, \beta_1^T$  defined between the chord of the fan blade and a straight line extending tangentially from the heel end of the fan blade, the intake angle being about 14.5 and 21.5 degrees, and an exit angle  $\beta_2^D, \beta_2^T$  defined between a line tangent to the imaginary circle at the tip end of the fan blade and a straight line extending tangentially from the tip end of the fan blade, the exit angle being about 40-46 degrees.

The fan further comprises a second plurality of fan blades coupled to the plate 14 and extending toward the back wall 18 (see Fig. 2).

Each blade 13 is curved and has a non-constant radius of curvature (see Fig. 3).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 4,378,196 (Leskinen hereinafter) as applied to claim 4 above, and further in view of United States Patent No. 6,299,409 (Matsunaga et al. hereinafter).

Leskinen show a fan having a plurality of blades on the impeller 2, but is silent with respect to the shape of the blades, particularly, the radius of curvature.

Matsunaga et al. teach in Fig. 14 that centrifugal impeller blades 72 should have different radii of curvature  $R_1$ ,  $R_2$ , for the purpose of reducing the low-frequency noise and reducing the power consumption of the motor (col. 9, lines 30-44) as compared to a blade with a constant radius of curvature (Fig. 13).

Since Leskinen is a centrifugal fan having a plurality of blades arranged thereon, and Matsunaga et al. teach to shape the blades of a centrifugal fan with a non-constant radius of curvature, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to shape the impeller blades of Leskinen with a non-constant radius of curvature, as taught by Matsunaga et al. for the purpose of

reducing the low-frequency noise and reducing the power consumption of the motor as compared to a blade with a constant radius of curvature.

Claims 79 and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 4,526,506 (Köger et al. hereinafter).

Köger et al., as explained above, show a fan having a blade with an intake angle  $\beta_1^D, \beta_1^T$  defined between the chord of the fan blade and a straight line extending tangentially from the heel end of the fan blade, the intake angle being about 14.5 and 21.5 degrees, and an exit angle  $\beta_2^D, \beta_2^T$  defined between a line tangent to the imaginary circle at the tip end of the fan blade and a straight line extending tangentially from the tip end of the fan blade, the exit angle being about 40-46 degrees. Köger et al. do not disclose the intake angle being at least 27 degrees.

At the time the invention was made, it would have been an obvious matter of design choice to a person having ordinary skill in the art to make the intake angle of Köger et al. at least 27 degrees because Applicants have not disclosed that at least a 27 degree angle provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected the blade of Köger et al., and Applicants' blade, to perform equally well with either the angle taught by Köger et al. or the claimed angle range because both angles perform the same function of maximizing the efficiency of the blades. It is noted that variables such as fluid temperature, impeller speed, and fluid viscosity, among others, affect the performance of the fan, and the optimal design of the fan blades. One having ordinary



skill in the art of impellers appreciates that two impellers operating under different variables (e.g. fluid temperature, fluid viscosity, impeller velocity) would have different blade geometries if both impellers were maximizing the impeller's efficiency.

Therefore, it would have been prima facie obvious to modify Köger et al. to obtain the invention as specified in claims 79 and 80 because such a modification would have been considered a mere design consideration which fails to patentably distinguish over the prior art of Köger et al.

***Allowable Subject Matter***

Claims 6-13, 75-78 and 81-84 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 14-70 and 85-122 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Claims 6-9 and 14-21 require among other things, a portion of the back wall and at least a portion of the fan blades to be located at a common axial position. Whereas Leskinen do not show nor fairly suggest a portion of the back wall 4 to be at a common axial position with a portion of the fan blades.

Claims 10-13 require among other things, the plate to be non-planar with an expansion angle between 0 and 25 degrees. Whereas Leskinen only shows a planar back plate 4 extending perpendicular to the rotational axis.

Claims 23-40 require among other things, an intake angle between 20 and 50 degrees, inclusive, and the plate being non-planar with an expansion angle between 0 and 25 degrees.

Claims 41-54 require among other things, an exit angle being between 35 and 60 degrees, inclusive, and the plate being non-planar with an expansion angle between 0 and 25 degrees.

Claims 55-64 require among other things, an angle between the chord of the fan blade and a straight line extending from the axis to the tip end of the fan blade between 5 and 30 degrees, inclusive, and the plate being non-planar with an expansion angle between 0 and 25 degrees.

Claims 65-70 require among other things, a camber to chord ratio between 5 and 20 percent, inclusive, and the plate being non-planar with an expansion angle between 0 and 25 degrees.

Claims 75, 76, 77, 78, 81, 82, 83 and 84, in addition to requiring the intake angle being between 20 and 50 degrees, inclusive, and the exit angle being between 35 and 60 degrees, inclusive, require either the angle between the chord of the fan blade and a straight line extending from the axis to the tip end of the fan blade between 5 and 30 degrees, inclusive, or the camber to chord ratio being between 5 and 20 percent, inclusive.

Claims 85-94 require among other things, an angle between the chord of the fan blade and a straight line extending from the axis to the tip end of the fan blade between 5 and 30 degrees, inclusive, and an intake angle between 20 and 50 degrees, inclusive.

Claims 95-100 require among other things, an intake angle between 20 and 50 degrees, inclusive, and a camber to chord ratio between 5 and 20 percent, inclusive.

Claims 101-110 require among other things, an angle between the chord of the fan blade and a straight line extending from the axis to the tip end of the fan blade between 5 and 30 degrees, inclusive, and an exit angle being between 35 and 60 degrees, inclusive.

Claims 111-116 require among other things, an exit angle being between 35 and 60 degrees, inclusive, and a camber to chord ratio between 5 and 20 percent, inclusive.

Claims 117-122 require among other things, an angle between the chord of the fan blade and a straight line extending from the axis to the tip end of the fan blade between 5 and 30 degrees, inclusive, and a camber to chord ratio between 5 and 20 percent, inclusive.

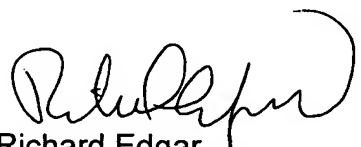
In the examiner's opinion, one having ordinary skill in the art, at the time the invention was made, and without the aid of Applicant's disclosure, would not have found it obvious to modify the Köger et al. reference cited above to have all of the claimed features including the numerical ranges, since the Köger et al. reference is silent regarding the setting angle and chord geometry of the blades, as well as the expansion angle of the plate.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard Edgar whose telephone number is (571) 272-4816. The examiner can normally be reached on Mon.-Thur. and alternate Fri., 7 am- 5 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Richard Edgar  
Examiner  
Art Unit 3745

RE